Claims

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1. Sensor element for electrically measuring the position of liquid levels, comprising

   – a substrate (2) and

   – a plurality of electrodes (3) that can be contacted individually and that are mounted on the substrate, characterized in that the electrodes comprise sensor-active partial electrodes (5) that are networked with electrical connections (7), whereby the partial electrodes of two respective electrodes are always positioned opposite one another, separated by a distance, as partial electrode pairs (11), and the electrode pairs (8) thus formed recur periodically over the length of the sensor.

2. Sensor element according to Claim 1, characterized in that the electrical connections (7) of the networked partial electrodes are coated with a passivating layer (6).

3. Sensor element according to one of Claims 1 or 2, characterized in that the partial electrodes positioned pairwise opposite one another are always separated by the same distance, and/or the distances between the partial electrode pairs in the longitudinal direction of the sensor element are constant over the entire length of the sensor element, and/or the number of partial electrode pairs per electrode pair is constant.

4. Sensor element according to at least one of Claims 1 through 3, characterized in that the distance between the partial electrode pairs in the longitudinal direction is in the range of 100 µm.

5. Sensor element according to at least one of Claims 1 through 4, characterized in that the substrate is made of silicon, glass, or plastic.

6. Sensor element according to at least one of Claims 1 through 5, characterized in that the electrodes are made of platinum, iridium, or gold.

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7. Sensor element according to at least one of Claims 1 through 6, characterized in that the sensor chip surface has wetting properties such that the boundaries of the liquid wetting of the sensor surface correspond to the liquid level.

8. Arrangement in which the sensor element according to at least one of Claims 1 through 7 is used for measuring a capillary filling, characterized in that the sensor element is attached to a capillary in such a way that the sensor-active partial electrodes (5) are situated inside the capillary and the electrical connection options are situated outside the capillary, and that at least one conductivity boundary of the capillary filling is located in the region of the sensor element.

9. Arrangement in which the sensor element is used according to at least one of Claims 1 through 7 and Claim 8, characterized in that two conductivity boundaries of operating liquids in the capillary form a bubble in the region of the sensor element, said bubble being bounded on both sides by the operating liquid.

10. Arrangement in which the sensor element is used according to at least one of Claims 1 through 7 and Claims 8 or 9, characterized in that the bubble is filled with gas, and/or the length of the bubble is approximately twice the length of an electrode pair in the longitudinal direction, and/or the same operating liquid is present on both sides of the bubble.

11. Method for measuring liquid levels using the arrangement according to at least one of Claims 1 through 8 and 9 and/or 10, characterized in that it is determined which electrode pairs are covered and which are not covered by the operating liquid by measuring the resistance of each individual electrode pair in the idle state of the operating liquid and comparing the resistance values to the characteristic minimum and maximum values for liquid coverage or no liquid coverage, and from this information the position of the conductivity boundary or of the bubble on a specific electrode pair is detected.

12. Method for measuring liquid levels using the arrangement according to at least one of Claims 1 through 8 and 9 and/or 10, characterized in that the position of a conductivity boundary within an electrode pair in the idle state of the operating liquid is determined

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by comparing the intermediate value lying between the minimum and maximum resistance value of the electrode pair to a reference resistance curve of the electrode pair, and the position of the conductivity boundary for a specific partial electrode pair is thereby obtained.

13. Method according to at least one of Claims 11 or 12, characterized in that the path distance traveled by the bubble is determined from the detected position of the bubble or of the conductivity boundary before and after movement of the bubble.

14. Method for measuring liquid levels using the arrangement according to at least one of Claims 1 through 8 and 9 and/or 10, characterized in that jumps in the resistance values upon movement of a bubble are detected by parallel monitoring of the resistance values of all electrode pairs, and the path distance traveled by the bubble is determined from the number of jumps.

15. Method according to at least one of Claims 13 or 14, characterized in that the displaced liquid volume is determined from the path distance traveled.

16. Method according to at least one of Claims 11 through 15, characterized in that the resistance measurement of the electrode pairs is performed by measuring the resulting current after an alternating current is applied to the electrodes.

17. Method according to Claim 16, characterized in that the alternating current has a frequency in the kilohertz range and/or an amplitude in the range of 100 millivolts.

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